

THE CHANGING APPLICATION OF MANEUVER

**A MONOGRAPH
BY
Major Kevin S. Woods
Engineer**

19970506 035

**School of Advanced Military Studies
United States Army Command and General Staff
College
Fort Leavenworth, Kansas**

First Term AY 96-97

Approved for Public Release Distribution is Unlimited

DTIC QUALITY INSPECTED 8

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data source gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 5 February 1997	3. REPORT TYPE AND DATES COVERED MONOGRAPH		
4. TITLE AND SUBTITLE The Changing Application of Maneuver		5. FUNDING NUMBERS		
6. AUTHOR(S) MAJ Kevin S. Woods				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) School of Advanced Military Studies Command and General Staff College Fort Leavenworth, Kansas 66027		8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Command and General Staff College Fort Leavenworth, Kansas 66027		10. SPONSORING/MONITORING AGENCY REPORT NUMBER		
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) Significant advancements in information technologies and precision weapons are providing an unprecedented potential for future warfare and challenging traditional applications of combat power. This monograph discusses one element of combat power--maneuver--and how its application in combat is changing. The monograph begins by defining maneuver and examining its purpose and traditional application. Joint Vision 2010 and Force XXI documents are then analyzed to determine how these new operational concepts are effecting maneuver. The conclusion is that maneuver, enabled by technology and driven by a changing threat, is gaining renewed emphasis and utility. Constraining this new found maneuver capability, however, will be the timeless effects of terrain and weather, the difficulty of changing a large bureaucracy like the US military, and the transient nature of military technological advantages. The monograph closes by summarizing the changing role of maneuver and by describing particular maneuver applications and effects.				
14. SUBJECT TERMS MANEUVER ATTRITION MANEUVER WARFARE FORCE XXI JOINT VISION 2010			15. NUMBER OF PAGES 55	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UNLIMITED	

ABSTRACT

THE CHANGING APPLICATION OF MANEUVER by MAJ Kevin S. Woods,
USA, 55 pages.

The current revolution in military affairs includes a confluence of changes that are forcing the US military to reexamine its methods of warfare. Significant advancements in informational technologies and precision weapons are providing an unprecedented potential for future warfare and challenging traditional applications of combat power. This monograph discusses one element of combat power—maneuver—and how its application in combat is changing.

The monograph begins by defining maneuver as the movement of forces to gain a temporal and positional advantage in relation to the enemy. To further broaden this short definition, the monograph examines the purpose and application of maneuver. The application of maneuver is portrayed as a function of the method of warfare a military employs. Most methods of warfare employed by a military fall along a spectrum between attritional warfare and relational maneuver. Attritional warfare emphasizes the effects of firepower, while relational maneuver emphasizes the effects of maneuver. The US military will define the future role of maneuver by its choice of warfare methods.

Joint Vision 2010 and Force XXI are the Joint Chief's and the US Army's vision of future warfare. The documents associated with these visions begin to describe a future method of warfare for the US military. Although these documents are still conceptual, they describe new operational concepts that are moving the application of maneuver away from attritional warfare and toward the aims of relational maneuver.

Two powerful forces driving this shift within the military are advancing technologies and emerging threats. The rapid advancement of technology, especially information technology, is giving commanders an unmatched ability to exploit the effects of maneuver. The effects of this superior maneuver will be a critical instrument of coercion against tomorrow's threat. The "new warrior class", knowledgeable of US capabilities, will be unswayed by the effects of just firepower. To defeat this persistent and impassioned enemy the US military will need to create weaknesses and break his will by applying the effects of maneuver.

Yet, the future application of maneuver will have limits. The effects of terrain and weather have significant potential to degrade maneuver regardless of superior technological advantages. Additionally, two characteristics have historically limited past RMA's. First, without strong external forces, it is difficult for large bureaucracies like the US military to foster significant internal change. Second, technological advantages are usually transient in nature. These two characteristics will likely limit the current RMA, and in turn, its influence on future maneuver.

The monograph closes by summarizing the changing role of maneuver and by describing particular maneuver applications and effects. Although the description is only cursory, it serves to illustrate a changing method of warfare where maneuver has primary importance.

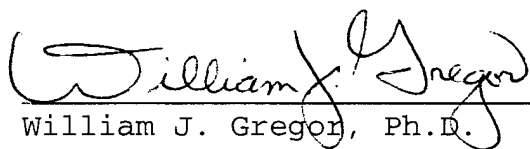
SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

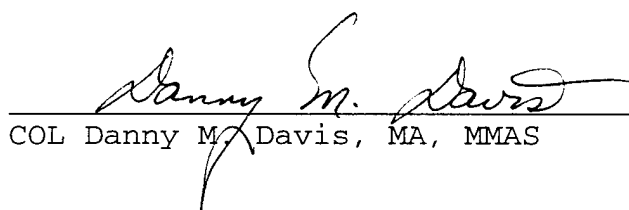
Major Kevin S. Woods

Title of Monograph: *The Changing Application of Maneuver*

Approved by:


William J. Gregor, Ph.D.

Monograph Director


COL Danny M. Davis, MA, MMAS

Director, School of
Advanced Military
Studies


Philip J. Brookes, Ph.D.

Director, Graduate
Degree Program

Accepted this 20th Day of December 1996

ABSTRACT

THE CHANGING APPLICATION OF MANEUVER by MAJ Kevin S. Woods,
USA, 55 pages.

The current revolution in military affairs includes a confluence of changes that are forcing the US military to reexamine its methods of warfare. Significant advancements in informational technologies and precision weapons are providing an unprecedented potential for future warfare and challenging traditional applications of combat power. This monograph discusses one element of combat power—maneuver—and how its application in combat is changing.

The monograph begins by defining maneuver as the movement of forces to gain a temporal and positional advantage in relation to the enemy. To further broaden this short definition, the monograph examines the purpose and application of maneuver. The application of maneuver is portrayed as a function of the method of warfare a military employs. Most methods of warfare employed by a military fall along a spectrum between attritional warfare and relational maneuver. Attritional warfare emphasizes the effects of firepower, while relational maneuver emphasizes the effects of maneuver. The US military will define the future role of maneuver by its choice of warfare methods.

Joint Vision 2010 and Force XXI are the Joint Chief's and the US Army's vision of future warfare. The documents associated with these visions begin to describe a future method of warfare for the US military. Although these documents are still conceptual, they describe new operational concepts that are moving the application of maneuver away from attritional warfare and toward the aims of relational maneuver.

Two powerful forces driving this shift within the military are advancing technologies and emerging threats. The rapid advancement of technology, especially information technology, is giving commanders an unmatched ability to exploit the effects of maneuver. The effects of this superior maneuver will be a critical instrument of coercion against tomorrow's threat. The "new warrior class", knowledgeable of US capabilities, will be unswayed by the effects of just firepower. To defeat this persistent and impassioned enemy the US military will need to create weaknesses and break his will by applying the effects of maneuver.

Yet, the future application of maneuver will have limits. The effects of terrain and weather have significant potential to degrade maneuver regardless of superior technological advantages. Additionally, two characteristics have historically limited past RMA's. First, without strong external forces, it is difficult for large bureaucracies like the US military to foster significant internal change. Second, technological advantages are usually transient in nature. These two characteristics will likely limit the current RMA, and in turn, its influence on future maneuver.

The monograph closes by summarizing the changing role of maneuver and by describing particular maneuver applications and effects. Although the description is only cursory, it serves to illustrate a changing method of warfare where maneuver has primary importance.

Table of Contents	Page
I. Introduction	1
II. Maneuver: Definition and Purpose	7
III. Joint Vision 2010 and Force XXI	16
IV. Technology	24
V. Changing Threats	30
VI. Terrain and Weather	34
VII. Uncertainties	40
VIII. Summary	43
IX. Conclusion	46
Endnotes	48
Bibliography	53

I. Introduction

The US military is in the middle of a tremendous whirlpool of changes. So great are the potential effects of these changes, many military analysts have come to believe the military is experiencing a revolution in military affairs (RMA). The significance of these changes extends beyond technological improvements to include social, political, and economic factors as well. The end of the Cold War, the declining defense budget and the beginning of what Alvin and Heidi Toffler have termed the "Information Age" are three powerful conditions shaping the environment in which the military operates today.¹ America's role as the world's uncontested military superpower further complicates the environment. To ensure America retains the security that comes from being the world's singular military superpower, the military must redefine itself and its methods of warfare in relation to these changes.

Militaries are often accused of not changing with the times; of fighting the last war. Militaries get it wrong by not making the changes necessary to stay in step with the evolving nature of war. Yet, making changes in the middle of so much uncertainty carries equal risk. The gamble of changing from traditional time-tested methods of warfare to well-intentioned untested methods runs the risk of deadly consequences. It is easy to see why most significant military changes occur during wartime rather than peacetime. Some of that risk, however, is offset by the opportunity to shape the future; to impact now the nature of the next war.

For the US military, the ability to shape the next war is significant. Of course the enemy will have a vote; nevertheless, the influential strength of the US military is such that its doctrine and technology are often the model for today's modern state. New concepts of warfare developed today will allow today's military to define, rather than be defined by, the next war. This redefining process will manifest itself in the application of combat power. The methods of warfare the US military selects will drive how commanders will use the elements of combat power (firepower, maneuver, protection, and leadership) to win America's next war. The purpose of this study is to determine whether one element of combat power--maneuver--might change in the twenty-first century.

The term "maneuver" carries a variety of meanings within the military, therefore, to eliminate confusion over terminology, this study begins by defining maneuver. A baseline of understanding is set by establishing a clear definition of maneuver in accordance with the Army's TRADOC Pamphlet 11-9, *Blueprint of the Battlefield* and the Marine Corps' *FMFM1, Warfighting*. Maneuver is defined as the movement of forces to gain a temporal and positional advantage in relation to the enemy. Consistent use of this definition will ensure a clear understanding of the term maneuver.

Just knowing the definition of maneuver, however, is inadequate. To determine the future of maneuver, it is important to understand the *purpose* of maneuver. The question of how the military *will* use maneuver in the future must begin by determining how it *can* be used. What are the traditional roles of maneuver? An understanding of how maneuver has been used in the past, will bring into focus how the military might apply maneuver in the future. To accomplish this, this study first examines the two

methods of war defined by the German historian Hans Delbruck: annihilation and exhaustion. The study then narrows the broad range of these methods by focusing on two methods within Delbruck's spectrum that have particular relevance to today's conventional modern battlefield. Edward Luttwak defines these two methods, or styles of war, as attrition and relational maneuver.² The purpose of warfare must be defined within the context of these two methods of war. As a military adopts a method of war, it also decides the role and purpose of maneuver.

The two contrasting methods of warfare in this study, attrition warfare and relational maneuver, may share the same means (i.e. weapons), but they are markedly different in their ways (doctrine) and in their ends (aims). Attrition warfare holds that the physical destruction of the enemy is the aim of war. Relational maneuver, however, holds that the aim of war is to sever the enemy's moral cohesion. In attrition warfare firepower is the means to the end, and *maneuver* serves only to position fires in order to destroy the enemy. Conversely, with relational maneuver, fire and maneuver are the means to the end. *Maneuver* is used as a "weapon" to create enemy weakness and to gain an advantage over the enemy either physically or psychologically. When a military chooses its method of warfare along the continuum between attrition and relational maneuver, it also chooses the role that firepower and maneuver will play. Thus, the US military's use of maneuver in the twenty-first century will be very much a function of the method of warfare the military chooses to employ. Militaries cannot always control how military technologies will advance. They can, however, control the method of warfare they employ. Employing a particular method of warfare ought to be a conscious decision based on the war aim and

the best means to achieve it. Delbruck affirms, the methods of war must change with the age in which they exist.³ As the US military reinvents itself, it must first select the method of warfare that is in accordance with its changing environment. Only then can the military proceed to define the future of maneuver.

Since the future of maneuver is largely dependent on a military's method of war, it is necessary to understand what method of warfare the US military will apply in the future. Change is already underway within the military. Each of the four services has set out a course for change to meet the expected needs of tomorrow. Most applicable to this study is Joint Vision 2010 (JV 2010), the Joint Chiefs vision for the future joint application of combat power, and Force XXI, the Army's own blueprint for change. Emerging within these documents are concepts and statements that indicate how the military is beginning to shift the goal of maneuver. No longer merely a means to deliver fires, the military envisions future maneuver as a decisive force capable of creating results far more effectively than fires alone. The military is breaking its traditional ties to attrition warfare.

Next, it is necessary to examine two powerful forces that are driving this shift within the military. The two forces of change are advancing *technologies* and emerging *threats*. Technology enables changes in maneuver, and in the process, technology increases maneuver's potential contribution to modern warfare. Likewise, the changing threat gives the military reason to change.

New technologies are radically challenging past paradigms of warfare. Technology can provide the commander near perfect knowledge of the enemy's strength and location.

This information can be transmitted digitally to precision munitions of massive volume and lethality. The ability to acquire this information and to transmit it has the potential to enhance any method of war. Advocates of attrition warfare can now destroy enemy forces with extreme effectiveness. Advocates of relational maneuver can now, with full knowledge of the enemy, gain the temporal and positional advantage with virtual assurity. Moreover, technology has reduced the high risk once associated with relational maneuver. The risk is now with attrition warfare. Once the only sure way to achieve eventual victory, the destructive aim of attrition warfare is losing its potency as a singular tool of coercion. As the old patterns of warfare change, firepower alone cannot produce the necessary conditions for successful war termination.

Such conditions as splintering international boundaries, global abject poverty, and spiraling population growth are producing a threat of a different character. Tomorrow's threat will not buckle as his material losses accumulate. The next threat promises to be doggedly persistent even when facing the technological might of the US. The enemy's strength will not come from trying to sustain a certain economic existence, but from a condition that finds war to be infinitely preferable to his previous existence. Ralph Peters calls this adversary the "new warrior class". Furthermore, whatever state, non-state, ethnic group, or tribe the US must contend with, they will fight with the support of an impassioned people willing to sacrifice greatly for their cause. Shattering this threat's moral cohesion, the aim of maneuver warfare, will be key to defeating it.

Yet, to believe technology enhanced maneuver or relational maneuver offer a sure solution to tomorrow's threat would be a mistake. To complete the examination of future

maneuver, it is necessary to understand the forces working to negate whatever potential maneuver may have in the future. This study discusses two of these key forces: terrain and weather and the uncertainties of the RMA's.

The RMA has sparked much discussion about the implications of technology on future combat. In theory the possibilities seem almost limitless. However, technology's promise is often unrealized when applied to actual combat. Terrain and weather are key factors that directly impact maneuver. Although, there are other combat constants, this study focuses on the effects of terrain and weather because historically they have degraded the advantages of maneuver. History has repeatedly shown that terrain and weather can reduce the importance of technological differences between opponents. For a force projection army like the US, the effects of terrain and weather will always be significant.

Like the constants of terrain and weather, the RMA itself contains many uncertainties that stand to limit the future of maneuver. The uncertainties inherent in any RMA, are the same uncertainties that will effect the future of combat maneuver. The study analyzes the outcomes of past RMA's to adjust and qualify any predictions about how maneuver will be different in the twenty-first century.

Finally, to complete the question of how maneuver might change in the twenty-first century, and to add further clarity to the previous sections, a description of future maneuver and its future application is necessary. This summary unifies the many concepts presented by illustrating them within the context of how they might manifest themselves in

future combat. This summary is merely one answer to the many possible ways maneuver might change in the twenty-first century.

In conclusion, the changes underway within the military will allow it to decide how to best fight the next war. Technology has significantly improved the combat elements of both firepower and maneuver. Both are more capable than ever before, and the advantages of both are more pronounced. The military has gained the ability to apply maneuver in new ways, but it will be the method of warfare that the military selects, attrition or relational maneuver, that will decide the role of future maneuver. The vastly enhanced potential of relational maneuver, however, promises to be the necessary tool for the combat environment of the future. If critical uncertainties are overcome, maneuver will likely redefine the future paradigms of combat.

II. Maneuver: Definition and Purpose

The US Army Training and Doctrine Command (TRADOC) published TRADOC Pamphlet 11-9, *Blueprint of the Battlefield*, to define the functions performed by the Army and standard definitions for use in combat development studies. TRADOC defines *tactical maneuver* as the employment of forces on the battlefield through movement and direct-fires in combination with fire support, or fire potential, to achieve a position of advantage in respect to enemy ground forces.⁴ *Operational maneuver* is defined as the disposition of forces to create a decisive impact on the conduct of a subordinate campaign

or major operation. Operational maneuver is accomplished by either securing the operational advantages of position before battle is joined or by exploiting tactical success to achieve operational or strategic results.⁵ Operational maneuver is integrated with fires but does not include fires to achieve its results. These definitions of maneuver, although commonly accepted within the military, fall short of identifying one other essential component of maneuver--time.

The above traditional definitions of maneuver are limited in that they define maneuver only in spatial terms. Maneuver is understood to be useful only in the geographical sense of gaining positional advantage over the enemy. Time is disregarded. Yet to outmaneuver an enemy, friendly actions must occur within the enemy's decision cycle. The tempo of friendly operations must be faster than the enemy's. The side that retains the initiative controls time. By controlling time, the friendly side gains a position of temporal advantage. Instead of executing actions in accordance with his own plan, the enemy then is forced to *react* to friendly actions. The advantage of time gained through speed creates opportunities to surprise the enemy and exploit weaknesses. The temporal advantage of maneuver is equally as important as positional advantage. To achieve more than just a temporary success on the battlefield, that is, to achieve decisive victory, the enemy must be defeated in both time and space.

What then is the purpose of maneuver? The answer to this question first depends on the strategy war employed. Strategy, according to the German historian Hans Delbruck, can be divided into two basic forms: the strategy of annihilation and the strategy of exhaustion. Both forms use maneuver differently. The sole aim for a strategy

of annihilation is the decisive battle. The strategy of exhaustion, which Delbruck also called the two-poled strategy, uses both battle and maneuver to attain its aim. In the exhaustion strategy, battle is no longer the sole aim. Instead, battle is merely one of several equally effective means of achieving the political objective of war. The commander employing an exhaustion strategy must know when to fight and when to maneuver. He must choose when "to obey the law of daring and when to obey the law of economy of forces."⁶ Delbruck further points out that neither of these two forms are a variation of the other, nor is one superior to the other. Delbruck names Alexander, Caesar, and Napoleon strategists of annihilation. Equally great were exponents of exhaustion, generals like Pericles, Wallenstein, and Frederick the Great.⁷

Although these two methods of war continue to exist today, a narrower set of opposing poles has more utility for the US military. Edward Luttwak defines these two opposing methods of warfare as attrition warfare and relational warfare. Both emphasize two distinct approaches to warfare and two different purposes for maneuver. Attrition warfare is based on the destruction brought about by firepower. Fires are the principal means for destroying the enemy. In attrition warfare, maneuver is merely the means to deliver those fires. In contrast, relational maneuver is based on movement. In relational maneuver, the aim is to shatter the enemy's moral and physical cohesion through superior maneuver. The difference between these two approaches to warfare is critical to understanding the potential for future maneuver. Although few armies use either method of warfare exclusively, US technology is rapidly improving the capability to conduct both. As the US military continues to define its future, it will ultimately choose its method of

warfare somewhere along the spectrum between attrition and relational maneuver. The choice the US military makes will define its mix of attritional and relational maneuver, and in turn, the role and purpose of maneuver. Because the choices between these methods of warfare will significantly influence the role of maneuver, a more detailed analysis of each is necessary.

Attrition Warfare

Attrition warfare seeks victory through the destruction of the enemy's material assets. The attritionist uses firepower to systematically destroy enemy targets and exact as great a toll as possible. Success is to be obtained by the cumulative effect of superior firepower and material strength.⁸ The emphasis on this efficient application of firepower lends itself to an almost scientific approach to war. Effectiveness is measured quantifiably through battle damage assessments, body counts, and captured terrain. In attrition warfare "victory is mathematically assured".⁹ Force ratios between friendly and enemy forces also play an important role. Attrition warfare demands a willingness to be attrited. Therefore, favorable ratios mean a battle becomes acceptable based on the ratio of friendly to enemy losses. In attrition warfare it is understood that the reciprocal attrition by the enemy will have to be absorbed. There can be no victory in this method of warfare without an overall numerical superiority. In attrition warfare there can be no cheap victories. Both sides pay costs in casualties and material in proportion to the enemy's strength.¹⁰ Attrition warfare seeks victory by destroying, if necessary, every physical thing an enemy can use to continue the war. If the enemy capitulates earlier than complete

destruction, so much the better. Attrition warfare is straight-forward, bull-ahead warfighting. Although attrition warfare does not exist in pure form, examples of warfare that were attrition-oriented include the trench fighting of WWI, and the Luftwaffe's attempt to defeat the Royal Air Force in 1940 by deliberately seeking air-combat engagements.¹¹ In attrition warfare the risks of losing are minimized, and the objectives are clear. However, the costs of attritional warfare can be high and its ultimate end state can be unpredictable.

The problem with destruction oriented warfare is that destruction by itself is often inconclusive. Once a bomb is dropped or a rocket detonated, the effect is over. The effects of firepower are often transient against a strong-willed enemy who will fight long after his war materials are gone. Destroying an enemy's material assets is often a very indirect and costly approach to defeating an enemy's fighting spirit. The continuous bombing of Britain by the German Luftwaffe in the Autumn of 1940 did not conquer Britain. Firepower and destruction alone were not enough to break the will of the British people.

Nevertheless, technological advancements in firepower often rekindle the idea of destruction as the most effective way to win a war. In 1940, as the airpower was growing in importance, Giulio Douhet, an attritionist, articulated an argument that has never completely died. Making little room for exception, he wrote that to "conquer the air means victory; to be beaten in the air means defeat."¹² From this axiom he drew his first

corollary: command of the air is necessary--and sufficient--to assure an adequate national defense.¹³ In other words all that is really needed in war is a dominant air force.

Douhet believed, like many of his contemporaries, that the enemy could be physically beaten into surrender. The bomber dropping massive firepower was enough to win. Their theory was as much about the effects of firepower as it was about the importance of airpower. Although Douhet's airpower theory has lost credibility with time, his ideas on the utility of massive destruction to win a war continue to linger.

Destructive firepower alone is seldom enough to cause an enemy to surrender. The firepower experiences of World War I validate this assertion. As the example below illustrates, artillery barrages in WWI, although lacking today's precision, were nonetheless devastating.

In April, 1917, at Mont Spin near Fort Brimont, a German battalion marching to counter-attack was seen from our observation posts. It was struck instantly by a heavy artillery concentration of all the calibers from 75's to 220's. It vanished so rapidly and completely that prisoners taken shortly thereafter from the battalion which succeeded it stated that they did not know or understand what could have become of the other battalion.¹⁴

Was this example a victory for firepower? It was a victory, but only in a temporary and narrow sense. After witnessing similar bombardments, General Faugeron, a WWI French artillery officer, observed that artillery fire can destroy everything that man can build, but destruction is never conclusive. Man is resilient and determined and what he needs or holds important he will endeavor to rebuild. The action of a single arm will result in nothing more than partial successes; combined arms is essential for a complete and definite result.¹⁵

Just as the previous illustration highlighted the awesome destructive effect of firepower, so too the short account of WWI fighting that follows highlights how firepower alone is inadequate against the moral forces of war.

On February 21, 1916, and later during the night of February 21-22, about 300,000 shells of all calibers fell on the Bois des Caures defended by only 1,200 men. In spite of the terrific bombardment, it was necessary for the 8,000 Germans who tried to capture it to renew their attack twice, each time engaging in several hours of deadly combat to overcome the immortal "Chasseurs de Driant.

Finally, four days later, on almost the same terrain the 3rd Battalion of the 146th entered the furnace. The commander, before starting, said to his assembled troops:

"We are about to get the worst shelling we have ever seen, under which no infantry up to now has ever been able to hold. Well! We Shall! And when the enemy infantry advances to occupy the terrain which it believes swept of every defender capable of resistance we shall charge him with the bayonet. And the soul of his men replied: "We shall hold! Count on us!"¹⁶

Accounts of soldiers still fighting on despite devastating attacks from artillery are excellent historical reminders that the psychological dimensions of warfare demand more than better weapons. To be effective firepower must be combined with maneuver. With superior maneuver opportunities and weakness are created that attack the enemy's will directly. Maneuver combined with firepower, or the threat of firepower, presents a dilemma to the enemy that forces him either to fight at a disadvantage or surrender. The effects of maneuver take away the ability of an enemy to persist.

Relational Maneuver

The difference between relational maneuver and attrition warfare is the manner in which maneuver is used. In attrition warfare, maneuver is used to seize a position from which fires can be placed on the enemy. Maneuver warfare, however, applies maneuver to create enemy weakness. Instead of seeking out the enemy's concentrations, since that is where the targets are most present, the starting point of relational maneuver is the avoidance of the enemy strengths, followed by the application of some selective superiority against a presumed enemy weakness. The enemy weakness may be physical, psychological, technical, or organizational.¹⁷

The goal of relational maneuver is to apply strength against enemy weakness. To create weakness, maneuver relies on speed and surprise. Maneuver is not tied to fires, but to gaining some advantage over the enemy either physically or psychologically. Relational maneuver uses maneuver to defeat the enemy by means other than simple destruction. Relational maneuver holds as the acme of success the preemption of enemy intentions. A force employing relational maneuver measures success by the degree to which the enemy's cohesion, organization, command, and psychological balance is shattered. The aim is to render the enemy incapable of fighting as a coordinated, effective whole. "The results of relational maneuver depend on the accuracy with which enemy weaknesses are identified, the surprise achieved, and the speed and precision of the action."¹⁸ Some combination of speed and surprise is a precondition for successful maneuver.

Firepower, however, is as essential to successful relational maneuver as it is to attrition warfare. How firepower is applied in maneuver warfare differs from attrition warfare. Relational maneuver uses fires selectively in order to enable maneuver. Focused

firepower facilitates the tempo necessary to dislocate and surprise enemy forces. As it supports the larger scheme, firepower is employed to suppress and destroy enemy forces. Firepower and maneuver are inseparable and complementary dynamics of combat.¹⁹

A final characteristic that separates attrition warfare from relational maneuver is risk. Attrition warfare is inherently less risky than relational maneuver. Although attrition warfare can succeed only cumulatively against an enemy, if it is unsuccessful it “fails gracefully”.²⁰ Because each error in attrition warfare is matched by only a proportionate penalty, catastrophic failure is unlikely. Relational maneuver, although riskier, offers the possibility of results disproportionately greater than the resources applied to the effort.²¹ The risk of relational maneuver is that it can fail completely if the selective strength that is narrowly applied against the enemy weakness fails. Failure results either from using an inadequate force or because the enemy was not as weak as presumed. In essence, the substantial advantages of relational maneuver depend heavily on accurate information about the enemy and the speed of the combat element that moves to exploit that information. The more that is known about the enemy, the less risky the maneuver. It will be shown later that information technology has contributed directly to reducing the risk of relational maneuver.

Delbruck’s theory did more than define two strategies. He showed that historically there could be no single method of war correct for every age. Like all aspects of warfare, strategies are intimately connected with national interests, resources, politics, the people, and the times in which they occur.²² Delbruck’s theory serves as a useful reminder for militaries to continuously examine the correctness of their strategy. Militaries must ask

themselves whether any changes have occurred that might force, or allow for, a better method of warfare to meet the new threat? Specifically, would the US military be more effective by adjusting the current method of warfare either to the left or right between attrition and relational maneuver?

These questions are being answered in a number of different ways. Service vision statements like JV 2010 and Force XXI have begun to postulate what they believe will be the military's new method of warfare, and in the process they are defining the role of future maneuver. Both envision significant technological enhancements that will greatly improve the capability of future maneuver. Yet, the purpose of maneuver within these documents receives only limited detailed discussion. Both concur that the ability of forces to maneuver will exceed all past capabilities, but to determine how this dramatic leap in capability will translate into applied maneuver, a close examination of the text is required.

Joint Vision 2010 and Force XXI

The ongoing changes inside and outside the military have sparked a renewed dialogue about battlefield maneuver. The capabilities of new weapons coupled with information technologies has most military thinkers expecting whole new implications for maneuver. With a tone that borders on hyperbole, military vision statements use terms like "maneuver dominance" to convey the battlefield of tomorrow. In some ways determining the future of maneuver should be as easy as reading the service description of

future maneuver. It is reasonable to expect that the future of maneuver will be just what the military decides--no discussion required. This expectation, however, would be correct only if the literature on the future of maneuver was more specific. Unfortunately, the documents that do exist are still rather new and somewhat limited in detail. The services, at this point, are currently engaged in multiple experiments to define further the role of maneuver. Nevertheless, it is possible to determine a general direction the Joint Chiefs and the Army are taking concerning maneuver. Comparing these ideas with the conceptual purposes of maneuver discussed in the preceding section produces a general understanding of how the military expects to use the effects of maneuver in the twenty-first century.

Service vision documents like Joint Force 2010 (JV 2010) and Force XXI, understand the potential of the RMA and are beginning to outline how it will change warfighting. JV 2010, the military's joint vision for how it will fight in the early twenty-first century, expects the capabilities of future maneuver to be significant. These future capabilities are so significant that JV 2010 lists "dominate maneuver" as one of its four emerging operational concepts. Although JV 2010 concedes that the implications of dominate maneuver are still undefined, it does suggest some specific ideas on future maneuver. According to JV 2010, dominant maneuver will be the multidimensional application of improved information, engagement, and mobility capabilities to position and employ dispersed joint forces to accomplish operational tasks.²³ Through a combination of asymmetrical leverage, achieved by positional advantages, as well as decisive speed and tempo, dominant maneuver will allow joint forces to apply decisive force to attack enemy

centers of gravity at all levels and compel an adversary to either react from a position of disadvantage or quit.²⁴ Nowhere in the JV 2010 concept is maneuver used as merely a tool to deliver firepower. In describing the relationship between fire and maneuver, JV 2010 states, "Increasingly lethal direct and indirect fire systems, with longer ranges and more accurate targeting, will increase the punch of...forces as they maneuver."²⁵

Not even the second new operational concept of JV 2010--precision engagement--includes destruction as an objective. The aim and methods of attrition warfare are in direct opposition to the concepts of JV 2010. Instead of relying solely on firepower to attrit the enemy into defeat, precision engagement technology is described as providing a "wider array of flexible and accurate options."²⁶ Obviously these *new* operational concepts are leading joint operations away from attrition warfare and closer to relational maneuver. The purpose of twenty-first century maneuver, at least within the vision put forth by the Joint Chiefs, will be to leverage RMA technology to preempt enemy actions while minimizing the loss of resources.

Specifics on maneuver are difficult to ascertain from US Army literature. It should be acknowledged, however, that Force XXI, the Army's vision of its future self, is purposely not a prescriptive concept. When discussing Force XXI, General Sullivan, began by reiterating that Force XXI is not a distinct "thing". It purposely "accepts various degrees of ambiguity, and a very wide spectrum of operations as routine."²⁷ Force XXI literature is best at describing how new technologies, especially information technologies, will change the nature of warfare. Reading such documents it is easy to find lists of how war is changing.

General Sullivan and LTC James Dubik in *Land Warfare in the 21st Century*

provide a concise discussion on just how the RMA will effect ground combat in the future. Although the effects discussed lack specificity, the report does present a good outline of what the RMA will mean to the US Army. Of particular use in defining future maneuver are the five dominate trends resulting from technological innovations. First increased weapon lethality will continue to expand the battlefield and disperse forces to ensure survival. Weapon systems like the ATACMs, Apache, and Patriot, in conjunction with space-based platforms are causing exponential changes in the dispersion of individuals and units.²⁸ The second trend concerns volume of fire and the rise in precision. As in the past, these new weapon effects will “change the weapons, equipment, organization, and the tactics of 21st century land forces.”²⁹ Integrative technology is the third trend. The capabilities of integrative technology will bring a greater “precision to the overall force.”³⁰ These first three factors join in reinforcing a forth effect--the trend toward the ability of smaller units to create decisive effects. This forth trend labeled “mass and effects” begins to discuss directly changes in maneuver.

The trend labeled “mass and effects” asserts that smaller units will be able to create decisive effects in three ways. First, smaller units will contain proportionately greater destructive capability. The empty battlefield will have less units on it, but those that are there will possess a far greater capability. Second, smaller units will continue to gain from fighting combined arms. Smaller, flexible organizations will combine to complement the strengths and weaknesses of each other, thus producing decisive effects. Lastly, the enhanced mobility of smaller units will improve *maneuver*. Smaller units will be able to

operate at a faster tempo, converge quickly at the decisive point, and concentrate the effects of fire and maneuver. This last point, although accurate, appears to relate maneuver only to the increased potential for *mobility*. Moreover, in discussing the fifth and last trend of “invisibility and detectability” the impact on maneuver is completely omitted.

The fifth trend of invisibility and detectability is described as a land force’s ability to hide from the enemy while being able to detect that enemy at greater ranges. Holography, virtual reality, the use of micro-electromagnetic systems, nano-technology, and televideo are all technologies described to make a land force invisible to the enemy. The integration of information from systems like the AWACS, JSTARS, and UAVs will greatly increase the commander’s ability to detect the enemy at extended distances.³¹ The effect of these revolutionary advances is described only in the capability it will give the commander. Nowhere do the authors describe how these technologies radically enhance relational maneuver. The ability to possess near-perfect knowledge of the enemy while remaining undetected completely reverses the need to take a slow, attritional approach to warfighting. Enemy weaknesses can now be exploited by friendly strengths, an inestimable advantage; yet it goes unexplored. A significant omission for a report on the future of land warfare.

Although there is much on trends and little on methods, a telltale sign of change comes at the end when the authors ask, “How will land combat be conducted in the 21st century? Their short answer provides a description that contains some elements of relational maneuver.

Regardless of how land combat forces are used, they will be capable--operating as part of a joint force--of detecting the enemy at extended over the horizon distances while remaining invisible to that enemy; delivering fires--also over the horizon--to facilitate maneuver; thus destroying the enemy force and disintegrating his cohesion throughout the depth of the theater or battlefield.³²

This general description is noteworthy because its intention is to describe *change*. The *facilitation of maneuver* seems to be central to the author's understanding of future operations. The pendulum pointing to the method of warfare appears to be swinging toward the pole of relational maneuver.

The most direct source to understand the Army's vision of future combat is TRADOC Pamphlet 525-5, *Force XXI Operations*. This pamphlet, describes Force XXI as the Army's conceptual foundation for war and operations other than war (OOTW) in the early decades of the next century. It describes, in general terms, how the Army will function in the future as the primary land force executing joint, multinational operations where domination of terrain or control of populations is central to victory.³³

TRADOC Pam 525-5 does not devote a specific chapter or section to the discussion of maneuver. Instead, it describes the purpose of future maneuver within the context of battle dynamics. The battle dynamics are the Force XXI's "framework to describe change"³⁴ The battle dynamics of *battlespace* and *depth and simultaneous attack effect* include points on future maneuver.

Battlespace is that volume of space and time that is "determined by the maximum capabilities of a unit to acquire and dominate the enemy."³⁵ Force XXI uses the dynamic of battlespace to focus on the changes that directly affect the capability of a commander to

defeat an enemy force. Force XXI describes one of these changes as “maneuver overmatch” attained through continuous high-tempo operations.

Well-equipped, future Army maneuver forces--operating at an operational tempo. . . will use an expanded array of joint weapons systems to engage enemy forces at greater distances with assured accuracy. Based on enhanced situational awareness . . . the operating tempo of these forces will be such that they will be able to outpace any adversary in both mounted and dismounted warfighting environments.³⁶

The purpose of this maneuver overmatch is discussed in this latter passage illustrating the effects of lethal weapons.

. . . Lethal reach over enemy forces will be essential to establishing maneuver force overmatch when maneuver forces alone, or disabling measures, cannot accomplish the mission....While fires are not automatically necessary to win, forces must be capable of using fires to gain the advantage.³⁷

In other words, defeating the enemy through superior maneuver will precede simple attritional methods. When gaining the temporal and positional advantage over the enemy is inadequate to achieve decisive results, improved firepower capabilities will ensure the Army continues to hold the advantage. Although the Army chooses not to declare allegiance to any specific method of warfare--attritional or relational maneuver--it is clear that technology is enabling the Army to advance toward a greater emphasis on relational maneuver.

The other Force XXI battle dynamic influencing future maneuver is termed *depth and simultaneous attack*. Under this dynamic, Force XXI holds that a “reassessment of the traditional relationship between fire and maneuver” may be necessary.³⁸ The concept of depth and simultaneous attack combines the concepts of deep attack with simultaneous

attack to extend the battlespace in time, space, and purpose; to reduce, if not entirely eliminate, the time and need to shape the battlespace; to facilitate full-dimensional attack of an enemy's center of gravity; and to accelerate his defeat.³⁹ The dynamic of depth and simultaneous attack will enable the commander to maximize the effects of both firepower and maneuver to stun, then rapidly defeat the enemy. Although the means will vary greatly, the "ultimate goal of depth and simultaneous attack is to overload the enemy's ability to cope with events by presenting him with an overwhelming number of actions throughout the depth of the battlefield."⁴⁰ This dynamic seeks to leverage new technology *and* maximize each element of combat power--maneuver, firepower, protection, and leadership. Depth and simultaneous attack maximizes the advantages of speed and surprise, seizes the temporal and positional advantage, creates and exploits enemy weakness, and preempts enemy reactions--in essence--it is relational maneuver magnified by technology.

In summary both JV 2010 and Force XXI use RMA technologies to enhance the purpose and effects of maneuver. Although the military is still in the process of determining the details, it is clear they envision a new, enhanced role for maneuver in the twenty-first century. To continue to add to this evolving vision of maneuver it is necessary to examine the technology that is making it possible.

IV. Technology

Information technology, growing at an exponential rate since World War II, has now brought the US economy and military to the brink of revolutionary transformations. This information revolution, resulting from the disproportionate growth in processing power, is creating a revolution within the military whose conclusion is difficult to envision.⁴¹ For many, Desert Storm provided the first glimpse of the effect this revolution has had on the military. For futurist like the Tofflers, Desert Storm ushered in a new form of warfare--something not seen for three hundred years. Desert Storm symbolized the initial transition of warfare from industrial age to information age, from brute-force to brain-force.⁴²

As stated in the introduction to this paper, uncertain geopolitical conditions and new information technologies are driving the military to reexamine itself and how it applies combat power to achieve the country's strategic objectives. These technologies for the most part are not revolutionary, nor are they silver bullets destined to end the problems of warfare. They are, however, "enablers" that if synthesized and applied with intelligence have the ability to assist in breaking old paradigms and building new ways in which to conduct war. Although there are many new technologies worth considering, this study will review them under two broad categories: precision guided munitions and information technologies.

During the 1972 air operation "Linebacker" the US dropped some nine thousand laser-guided bombs on Southwest Asia--roughly the same number of bombs dropped

during the Gulf War.⁴³ These precision bombing capabilities and their growing potential led the Army to make precision strikes one of their five modernization objectives. For the Army, the PGM family will include such systems as the Army Tactical Missile System (ATACMS). ATACMS is a ground-launched, conventional, surface-to-surface, semi-guided ballistic missile. Designed to be fired from the multiple-launch rocket system (MRLS) launcher, its Block I and II missiles have a range of approximately 140 kilometers and 280 kilometers respectively. When fired with the Brilliant Antiarmor (BAT) Submunition it is capable of destroying individual moving armored vehicles without human interaction.⁴⁴ ATACMS is one example of a growing precision strike capability.

Precision guided munitions (PGM's) such as the ATACMS provide a significant strike capability to the battlefield commander. Given the range, speed, and lethality of PGM's, enemy elements can be engaged simultaneously throughout the tactical depth of the battlefield at greatly reduced risk to friendly units. Some see significant changes as a result. Retired Army Brigadier General Huba Wass de Czege believes precision strike will "define the future of tactics". This is understandable when one recognizes the firepower associated with the Army's experimental Mobile Strike Force (MSF). Although still only an Advanced Warfighting Experimental force, the MSF consists of three ground brigades, one aviation brigade, one division artillery brigade, one engineer brigade, one division support command, and one mobile support group. Armed with proven technologies capable of being fielded by the year 2010, the MSF could, in theory, attack and destroy all 800 fighting vehicles and 2,200 support vehicles in an average division in a 10-minute engagement.⁴⁵ With such firepower, traditional ideas on when and where to maneuver

ground elements seem to be antiquated and unnecessary. Precision firepower is creating the freedom of action necessary for superior ground force maneuver.

Although it is obvious that long range precision fires significantly increase the military's ability to wage attrition warfare, what is less obvious is that these same systems have the potential to greatly enhance the purpose of maneuver in future combat. PGM's will enhance relational maneuver in at least three important ways. First, relational maneuver, reliant on speed to create and exploit enemy weakness, will allow maneuvering units to become lighter and more mobile. In theory, maneuver units can focus on speed and allow the weight and support limitations inherent with firepower to remain "on-call" from follow-on supporting units. Second, PGM's can reduce one of the inherent dangers of relational maneuver; that is, the risk of encountering unexpected superior enemy forces at places where a weakness was expected. Small maneuver forces, once vulnerable to unexpected enemy engagements, can now access a massive volume fire either to assist in defeating the enemy or to cover the maneuvering unit's disengagement. Improved firepower, therefore, increases the protection of maneuver elements. Finally, PGM's will in some cases, allow fires to "substitute" for ground forces in the close fight.⁴⁶ PGM's fired from a multiple of platforms can provide the firepower necessary to open lanes through enemy lines, penetrate, and gain the freedom of action necessary to exploit the effects of maneuver. PGM's can preserve precious maneuver forces while setting the conditions that maximize the advantages of relational maneuver.

Equally important as precision munitions are advancing information technologies. In general, information technologies will provide commanders with three unprecedented

capabilities. First, commanders will be able to rapidly and precisely locate enemy forces. Second, commanders will know where their own friendly forces are in relation to the enemy. Finally, communications will allow commanders to share this information with all friendly committed forces to develop a shared perception of the battlefield. The result will be an Army able to observe, decide, and act faster than the enemy.⁴⁷

Technologies facilitating these new capabilities will come in part from advances in intelligence and targeting sensors. Using a network of space-based satellites, airborne systems, and hand-emplaced systems, it is possible to observe and track every enemy element from initial movement to destruction. Systems such as the airborne Joint Surveillance Target Attack System (JSTARS) will pass information to the Army's Ground Station Module for rapid processing and dissemination to the field commanders.⁴⁸ The commander will have both an accurate picture of the fight and the means to pinpoint moving and fixed targets for precision strike.

From these sensors information will move digitally to users. Digitization will dramatically enhance the speed and quantity of information at all levels. A key to receiving this vast amount of accessible information and converting it into a relevant common picture (RCP) for all users will be Army Battle Command System (ABCS) --a seamless, tailorable, and interoperable umbrella architecture designed to provide the Army a common automated battle command system.⁴⁹ Larger amounts of accurate information, packaged for use by the commander, will vastly improve a unit's planning, deciding, and executing abilities. A RCP of friendly and enemy forces in real or near-real time is nothing less than a revolutionary step in executing effective relational maneuver.

This RCP or *situational awareness* will enhance relational maneuver in several ways. Maneuver units will be able to maintain unity of effort while dispersing further apart than ever before. Gone is the need to maintain physically grouped forces for purposes of command and control. The long columns of vehicles conducting movement operations and the large massed formations near the enemy are no longer necessary or advisable. Shared situational awareness permits forces to disperse and thereby denies the enemy the massed, lucrative targets of the past. Furthermore, a shared situational awareness will increase the mobility of units by minimizing the need for wide avenues of approach. Instead, small elements can maintain contact with their units while moving along concealed and secure routes. This will enhance the protection and mobility of the force. From dispersed dispositions elements can then rapidly move to a point of concentration, execute their task, then redisperse.

Most importantly, superior situational awareness will enable maneuver elements to set the preconditions for successful relational maneuver. Knowing where the enemy is and what he is in the process of doing allows the friendly commander to act faster. Having accurate knowledge of the enemy while at the same time denying him knowledge is *information dominance*. By dominating information the friendly commander gains the temporal advantage of superior maneuver. In essence, the informational superiority that comes from a superior situational awareness provides the friendly commander with the speed and surprise necessary to create then exploit enemy vulnerabilities while significantly reducing the risk traditionally associated with relational maneuver.

All the capabilities just mentioned, however promising they might appear, are only giving the military the *means* to change its application of maneuver. It is the changing threat that is providing the *reason* to change. The effects of maneuver provide the necessary force to combat the new emerging threat. The enemy of the future knows the technological superiority possessed by the United States, and if he chooses to fight, will do so because of a psychological strength he believes he possesses over the United States. Methods of defeating him will rely on the enhanced maneuver gained by these technologies.

V. Changing Threats

"However absorbed a commander is in elaboration of his own thoughts, it is sometimes necessary to take the enemy into account."

-Winston Churchill

For some time now US Army doctrine has openly wrestled with the challenge of how to defend strategic interests that reach to almost every corner of the earth. The trend in international relations continues to forecast conflicts in remote areas for a variety of reasons. It appears to be just a matter of time before US global interests clash with those nations troubled by poverty, and lawlessness. Given a wide spectrum of conflict for which to prepare, capability planning against worse case scenarios remains the most important planning criteria. Forces and doctrine must be designed to defeat competitors of equal or superior technology because only such wars threaten US survival. Nevertheless, small conflicts against lesser opponents are the battlefields of today and tomorrow.

It is no surprise that the nature of the next threat facing the US will be different. One significant difference will be the tools that less developed cultures employ to defeat the US. Without the advantages of superior warfighting technology, adversaries of the US will have to rely on other strengths to bring down US forces. In addition to niche technologies, it will be the strong will and persistence of future threats that will challenge the capabilities of the US. The great danger to the US on the field of battle will be an enemy impassioned by deep cultural beliefs, buttressed by an entire people, and sworn to

fight on indefinitely. This is the changing threat that is emerging to contest the global interests of the US.

Tomorrow's enemy is unlikely to look, behave, or react like the OPFOR at the US combat training centers. Samuel P. Huntington, argues in "The Clash of Civilizations?" that the great divisions among humankind and the dominating source of conflict will be cultural. The clash of civilizations will dominate world politics. The fault lines between cultures will be the new battle lines of the future.⁵⁰ Robert Kaplan further adds that the once significant borders separating and delineating sovereign states have faded and are being replaced by the more tangible and intractable boundaries defined by culture and tribe.⁵¹ Replaced will be what William Lind has termed the "Western Civil Wars"--those great wars fought between western states, princes, and ideologies.⁵² In its place will be war waged by groups bound together by a powerful cause and committed to fighting with all available means.⁵³ The military will require new methods of applying combat power to defeat this new threat.

The composition of these new combatant groups are what Ralph Peters has irreverently dubbed the "new warrior class". Dropouts from fractured states and disposed militaries, the number of criminal warriors will continue to grow. Possessing an amoral talent for violence, these thugs are individualistic, addicted to the criminal spoils of war, and are typically bound to a charismatic leader, cause, or financial employer.⁵⁴ They fight because it is preferable to the mundane, poverty-ridden existence that awaits them otherwise. They have little to lose and bow only to committed and persistent strength. Like eating and sleeping, fighting for them is in many ways the end rather than the

means.⁵⁵ Their objectives and rationale may be incomprehensible to us, but their violence and methods are nothing new. It is wishful thinking to believe they can be bombed into going home. Stand-off firepower alone will mean little to this adversary. To break his will it will be necessary to uncover and attack his weaknesses. Moreover, in most cases, the nature of this threat to the US will not merit the costs associated with attrition warfare. For this enemy, relational maneuver provides the tools for rapid, effective victory.

Another component to war's changing paradigm is the role of the people--both friendly and enemy. War is no longer the sole domain of the military. It now involves entire populations. The outcome of war depends more on the collective will and passions of these peoples than on the capability of their militaries. Their involvement will bring about what General John R. Galvin referred to as "uncomfortable wars".⁵⁶ Violence will become less confined to the battlefields as whole populations immerse themselves into the fighting. Amiable diplomatic tools such as treaties and armistices will be useless in these headless conflicts. The governments of these collapsing states, unable to protect or govern their people, will be unable to dictate the end to fighting. The people and their passions, not the heads of state, will dictate peace terms.

Wars involving societies are hard to understand and even harder to predict and control. Nevertheless, internal wars, in which the societal dimension is of crucial importance, has become the dominant form of conflict.⁵⁷ Of the 125-150 conflicts in the last 40 years, 90 percent occurred in developing regions and are best characterized as internal wars.⁵⁸ This trend is likely to continue as 95 percent of the earth's population

growth will be in the poorest areas of the globe where shrinking resources, environmental problems, and shifting borders and power centers will magnify the chaos.⁵⁹

Just as the enemy will find deep strength in its people, the US military can expect continued support from the American people. However, support by the American people for wars fought for reasons not directly related to US security will continue to come with conditions. The American people aware of the military's technological advantages, and how much it cost to achieve it and sustain it, believe that US forces will achieve rapid, decisive results. They expect technology will substitute for brute force and, as a result, expect low casualties. Recent operations like Just Cause and Desert Storm have reinforced this expectation.⁶⁰ These new rules, as uncomfortable as they may be, will be reinforced by a media that is ever-present and ever-vigilant. Commanders, constrained by the opinions of politicians far from the arena, will be held accountable for what may be deemed needless collateral damage and unnecessary risk to American lives.⁶¹

To meet the demands of these new threats while remaining within the tightening parameters set the American people, the methods of war must shift. Firepower and destruction, aimed at breaking the enemy's will to fight will not be enough or even necessary in every circumstance. What will be necessary is a renewed emphasis on maneuvering the soldier go face-to-face with the enemy. Lethal, long-range firepower essential for conventional success will be less important in these struggles. Maneuver will be necessary to achieve success. Breaking the will of a fervent population, or even the new criminal-warrior class, will require the psychological force that comes with rapid

occupation and committed presence. Winning will require the ability to dominate the time and space of the battlefield--superior maneuver.

VI. Terrain and Weather

For a unit to fully exploit the effects of maneuver, the unit must possess mobility equal to or greater than the enemy. Mobility is defined as the ability of a military element to execute movement in accordance with the will of the commander. Although some may view mobility strictly in terms of how fast combat systems can move, this view is incomplete. The mobility of a unit consists of many variables. Some of these variables are internal to the unit and influenced by such factors as equipment capabilities, maintenance capability, training, and leadership. Other variables are external to the unit and include such factors as the enemy, terrain and weather. A unit's mobility is an aggregate of all these variables. Yet, of these many variables the effects of terrain and weather are unique.

What separates terrain and weather is that they are constants of combat. They are present in every battle and frequently influence the outcome with extreme onesideness. Yet terrain and weather are neutral in character. They are factors that either side can use to either facilitate friendly mobility or degrade enemy mobility. It is the side most prepared to exploit their advantages and disadvantages that gain from their presence on the battlefield.

For a military seeking to gain from the effects of maneuver, terrain and weather are prominent factors. The technology of the RMA has given maneuver an unprecedented capability; yet at the same time, the improvements to maneuver do not directly contribute to overcoming the effects of the terrain and weather. One need only look closely at the terrain of Europe to realize the difficulties terrain presents to rapid movement and synchronization of small, dispersed combat elements. In Germany, attacking units can expect to encounter an average of five terrain gaps greater than 20 meters, five gaps between 6 and 20 meters, and fifteen gaps between 2 and 6 meters for every twenty kilometers moved. Major water obstacles occur every three kilometers in east-west travel and every five kilometers in north-south travel. Moreover, the effects of unexpected weather will greatly magnify the impact of these existing obstacles. The US military's recent deployment into Bosnia-Herzegovina during Operation Joint Endeavor reaffirms this point. Crossing the flooded Sava River during entry operations required every bridge asset in theater, created a significant chokepoint, and slowed operations.⁶² It is difficult to estimate how future maneuver units operating dispersed would have overcome such a formidable obstacle.

Military history presents countless examples of the effects of terrain and weather on maneuver and movement. A post-WWII historical study of effects of climate on combat, reported that in December 1941 the 6th Panzer Division was just 9 miles from Moscow when the temperature suddenly dropped to -30F. This change in temperature coupled with a surprise attack by conditioned Siberian forces stopped the German advance. Paralyzed by cold, the German troops could not aim their rifles. Bolts jammed

and striking pins shattered in the extreme cold. Machine guns became encrusted in ice and mortar shells detonated in deep snow with a hollow and harmless thud. German tanks could not move in the snow because of their narrow tracks. The terrain and weather had become the decisive factors which leadership, bravery, and technology could not overcome. Hitler had neither expected nor planned for a winter war.⁶³

Even during the summer months on the Eastern Front, weather had a severe effect on maneuver. The normal rich fertile soil found in the Ukraine quickly became a quagmire after only a few minutes of rain. Eventually road surfaces would become so churned up that vehicles could not continue. In the autumn, motorized traffic was completely halted by the rain. The German's, greatly impeded by the effects of weather on terrain, resorted to driving on railroad lines or building corduroy roads when lumber was available.⁶⁴ The German Army, reliant on its superior mobility over the Russians, was restricted by weather and terrain.

During the Korean War the enemy was able to use terrain effectively to compensate for lesser firepower. Captured enemy documents indicated that the North Korean and Chinese Communist forces were well aware of the capabilities and limitations of US tanks. In general, the US forces failed to surprise enemy forces because inadequate road networks and restrictive terrain prevented swift movement. Terrain reduced the normal speed and shock effect associated with tanks. Unable to move, tanks were used like artillery to support the movement of dismounted infantry. Moreover, the Army preferred the heavier M46 tank over the medium M4A3E8 because of its ability to turn and negotiate the narrow, twisting roads and trails commonly found in Korea. After

almost two years of continuous use the roads began to deteriorate. The deterioration was so great, that during the spring thaw of February 1951, the commanding general of the 3rd Infantry Division ordered all tanks to stay off the roads⁶⁵ Again terrain and weather greatly evened the playing field by reducing maneuver to a secondary role.

Besides overcoming existing natural obstacles, future maneuvering units will contend with reinforcing obstacles of an unprecedented magnitude. Reinforcing obstacles such as mines, blown bridges, and rubble urban areas will place heavy demands on the mobility capability. Maneuver commanders will contend with advanced countermobility technology of unprecedented quantities. Minefields that were once limited to linear concentrations near the enemy, will be scattered throughout the tactical depth of the battlefield in a matter of minutes. For example, within minutes a Russian multiple rocket launcher battery can produce an effective four square kilometer scatterable minefield.⁶⁶ Currently more than 22 countries possess scatterable mines.⁶⁷ New methods will be needed to overcome these significant obstacles to maneuver.

The traditional methods of breaching minefields may be no longer practical with smaller, dispersed moving elements. Centralized breaching efforts that massed breaching equipment to provide 2-3 lanes per battalion-size task force were ideal for large friendly formations conducting attrition warfare by attacking into the strength of an enemy prepared defense. However, if the Army of the future moves in small clusters of combat vehicles traveling on multiple routes, then it may no longer be possible to mass to overcome obstacles. Maneuvering units seeking to dominate the battlefield though speed

and surprise will require breaching equipment suitable for decentralized, small unit mobility.

Technology has not made it much easier to cross rough terrain in the past, nor is technology likely to do so in the near future.⁶⁸ Terrain and weather remain the neutral force with which all armies must contend. Terrain, however, tends to favor those armies who embrace its strengths, and tends to hinder those armies who ignore its relevance.

Because the US Army is a *force projection* army required to deploy and fight anywhere in the world, the advantages of terrain and weather will often reside with the enemy. Overcoming and rapidly adapting to these terrain and weather effects will be critical to gaining the speed and surprise necessary for relational maneuver. Future combatants facing a superior US military will find their combat power enhanced by the effective use of terrain and adaptation to the weather. The terrain of foreign lands may be a critical factor in operational planning and doctrinal development. One needs only to glance at a few possible theaters to understand why. For example, in the world's flattest and driest region, the Western Sahara, the vast empty spaces make movement and supply difficult for mechanized forces while providing an excellent defensive setting for guerrilla operations. For regular forces fighting in this desert, the terrain would greatly aid the native people capable of operating in small, mobile bands. These traditional guerrilla threats, well practiced in stealth and possessing a vast knowledge of the complex wadis systems, would be difficult to nail down and destroy even with the latest in RMA technology. In Afghanistan, where the land is high, dry, and rough, the Soviets quickly found the fractured landscape to be enormously difficult for conventional mechanized

forces designed to fight on temperate plains. The terrain was the great equalizer, neutralizing Soviet operations designed around speed and exploitation. In Central America the terrain problems are wholly different, yet equally difficult. Except for narrow coastal plains and valleys, most of it is rugged mountains. Central America is wet and forested with an average rainfall of over 40 inches per year and over 100 inches on the highest ridges. These guerrilla havens do not present many targets because the population is sparse. Consequently, guerrillas direct their operations toward the few cities to maintain the government's attention. The terrain here, like Vietnam, degrades maneuver and demands innovative approaches in applying combat power in order to succeed.⁶⁹

In summary, RMA technology alone is not adequate to achieve maneuver dominance. Precision firepower and informational dominance will enhance mobility but they cannot completely compensate for the tremendous influence of terrain and weather. Terrain and weather are combat constants that will lock JV 2010 and Force XXI maneuver concepts the realities of war. To overcome their effects it will take the traditional mobility enablers such as flexible leadership, versatile equipment, and quality training all focused toward fighting and winning through superior maneuver.

VII. Uncertainties

It is necessary at this juncture to reinforce the point that is not possible to predict the future. This seemingly obvious point can quickly be forgotten when caught up in the fury of trying to decide today the needs of tomorrow. The expectations associated with emerging technologies are often both exciting and complex. Much is at stake in war and mistakes bring deadly consequences, yet the chances of the military meeting the all the needs of the future are low. Whatever expectations the military might envision about warfare and maneuver in the next century, it is likely to be wrong on at least some point. As Michael Howard stated, “. . . Whatever doctrine the Armed Forces are working on now, they have got it wrong.”⁷⁰ Much like today, an infantry officer writing in 1956 forecasted what he believed to be the radical changes ahead for the Army: Taking what he believed to be the driving forces of his day he predicted the *future of maneuver*:

The linear type of position defense heretofore employed will be replaced by an area concept in which tactical formations will be dispersed in space.... Offensive action--to include large scale counterattacks--will be preceded by extensive surveillance and reconnaissance to determine enemy dispositions followed by violent action to effect his distraction. All operations will be fluid in nature as combat formations, dispersed in space, mass swiftly to achieve superiority of force at a selected point and just as rapidly disperse to exploit the advantage gained.⁷¹

Interestingly, not only was the above author's forecast wrong, but also his prediction for the future of combat operations resembles today's forecasts. Just as events proved his prediction wrong, future events may also undermine our own prognostications.

Not only is the future uncertain, but so are the outcomes of most RMA's. It is reasonable to expect that many of the expectations associated with the RMA will be diminished during the course of their development. External factors, some known and many unknown, will undoubtedly intercede to lessen the impact of the RMA, technology, and in turn, future maneuver. Just as the terrain and weather serve to anchor maneuver to physical realities, so to will the realities of the RMA shape just how much maneuver will actually change in the future

Andrew Krepinevich after studying ten military revolutions since the fourteenth century, postulated several notable lessons. First, emerging technologies only make revolutions possible. To realize their full potential organizations must incorporate them through processes and structures.⁷² For the Army, this means changes not only to force structure, but also to doctrine. Change of this magnitude, however, is unlikely because of the risk involved. Sweeping changes to force structure and doctrine are risky because they are expensive and untested. The nature of the next war is uncertain, the technology of the next war is unproven, and threat of the next war is unknown. To reduce risk incremental changes to force structure and doctrine will likely prevail. However, too incremental of change will bring its own risk as potential enemy's, with less to lose, are driven to take revolutionary leaps in their methods of warfare to remain "competitive". Clinging to obsolete paradigms out of a sense of comfort and familiarity may be the US Army's greatest obstacle to overcome.⁷³

Second, the competitive technological advantage the US currently enjoys is likely to be brief.⁷⁴ Because of high development costs, or because they are often commonly

adapted from available commercial products, military technologies are often sold to other nations and absorbed by other militaries. Moreover, major technological inequalities usually occur only when there has been a total miscalculation of capabilities between opponents.⁷⁵ Although the US military shocked the Iraqi military during the Gulf War, shocking our next opponent grows is less likely. In today's global economy of shared information little remains secret for long. However, if "technological shock" should occur, and the less advanced party survives its first encounter with the US military, history indicates the weaker side usually makes up the difference very quickly. If unable to overcome the disparity, the weaker side tends to implement guerrilla tactics to continue the fight.⁷⁶ This lesson from past RMA's is a reminder that concepts like *maneuver dominance* and *deep and simultaneous attack* may be only be a temporary possibility. The role of future maneuver should not be built solely on the shifting sands of technology.

Finally, just as there is danger in holding adamantly to past ideas of combat, there is equal danger in believing too strongly in any one future scenario. Defining trends and generalities to help envision the future provides military planners focus and encourages priorities, but it has limitations. Specified uses of technology captured in official "vision documents" can quickly begin take on a life of their own. After all the work put into the ideas of JV 2010 and Force XXI, there is a natural reluctance to challenge their basic assumptions. For the military to gain the most from this RMA documents like JV 2010 and Force XXI need to continue to encourage open and candid input.

VIII. Summary

"...at certain periods of history a superiority in the organization and equipment of an army has given a great moral preponderance: we find at other periods a great superiority in mobility had a like effect: at one time we see a new system of tactics brought to light: at another we see the art of war developing itself in an effort to make skillful use of ground on great general principles: and by such means here and there we find one General gaining great advantages over the other."¹⁷

The study thus far has: 1.) defined maneuver and placed it in a context of warfare; 2.) presented the military's initial impressions of future maneuver; 3.) presented the key technologies enabling maneuver to change; 4.) described a future threat that is forcing the purpose of maneuver to change; and 5.) described some of the combat constants and uncertainties that may limit the extent that maneuver actually changes. Yet, these are not enough to complete the study question. To complete the answer to how maneuver might be different in the twenty-first century, it is necessary to present an example, a scenario that illustrates how these pieces fit together.

The influence of technology as a driving force is substantial. Although not determining the future, precision weapons and information technologies will *drive* the future. The lethality and range of precision munitions has challenged traditional concepts of tactical and operational fires. The commander is now, more than ever before, able to apply firepower while minimizing risk to his soldiers. In high intensity conflict, the first priority of offensive ground forces has often been to penetrate the enemy defense in order to gain freedom of action for the commander. At the tactical level of war, the penetration is often a battle of attrition requiring the massing and synchronizing of assets to be

successful. The trade-off was between massing fires in the close fight versus applying fires against deeper targets. Deep fires were aimed at enemy forces currently influencing the close fight like enemy artillery and C2 nodes; or reserve and second echelon forces waiting to exploit weaknesses. Combat forces, constrained by the terrain, met enemy combat force of similar value and fought until one side was combat ineffective. This is the everyday scenario at the National Training Center, but this is no longer the only choice.

PGM's can strike targets throughout the tactical depth of the battlefield and can engage both close and deep forces simultaneously. Enemy reserve forces, once the great unknown, can now be located, avoided, or interdicted before they close with friendly forces. Most significantly, ground forces can now preserve precious combat power and drive deep against critical, decisive points. The selective destruction and penetration of enemy front-line forces can be the primary responsibility of PGM's fired from multiple platforms. Precision fires can provide the necessary freedom of action sought by the commander while avoiding the high cost, attritional close fight. The will of the enemy can be attacked directly; not with attrition warfare, but by determined maneuver forces attacking enemy weaknesses that net decisive results.

The situational understanding from sensors, digital links, and information processing will reduce the friction of moving maneuver forces. Dispersed units on the modern battlefield will be digitally linked in task and purpose. Unhindered by large, cumbersome formations, small maneuver elements will gain the advantage of speed and stealth. Possessing real-time information on enemy locations and tremendous on-call firepower, these "sub-units" can choose to fight or bypass an enemy in accordance with

the commander's intent. Enemy operational reserves poised to counterattack will find nothing to mass against. Commanders will select new maneuver objectives orchestrated to place ground forces into positions that paralyze the enemy. With superior maneuver friendly maneuver forces can move and fight where enemy forces, like artillery or logistical nodes, cannot resist. Tactical and operational maneuver will blur as targets are hit simultaneously and with diverse assets. Airpower, both fixed and rotary wing, can magnify their contribution to the close fight by employing longer-range precision weapons, confident in their knowledge of both friendly and enemy locations. Their inability to hold ground will matter little since their purpose will be to destroy forces that may interfere with ground force maneuver--isolating friendly forces against enemy strengths. All these possibilities pose a significant reversal from current methods of maneuver.

As leaders in the twenty-first century struggle with the nature of war, the psychological defeat of the enemy will continue to grow in importance. How victory will be determined will rely less on casualties and material destruction and more on taking away the enemy's options. Instead of challenging his will to resist through massive firepower, the Army will apply combat force to take away his ability to resist. The application of combat force will shift firepower to a position of support to maneuver. The nature of the threat will require soldiers to physically maneuver into positions that bring decisive results and leave the enemy no way out. Firepower will find its greatest contribution in creating the conditions that bring freedom of action to US commanders. As the world watches, the restraints against push-button destruction of non-combatants

and associated collateral damage will force commanders to use superior maneuver to eliminate the modern emerging threat.

Enemy guerrilla forces finding protection in dispersion and mobility within restricted terrain, will face US forces able to effectively operate equally dispersed, but digitally linked and unified in effort. Success will come from the Army's ability to permeate and dominate areas rather than capturing terrain or lines of communication. The aim will be to paralyze the enemy rather than crush his forces. Instead of the predictability of linear force concentrations, fluidity of maneuver will serve as the mechanism to unhinge the enemy. Most importantly, however, will be the leaders and soldiers. They will operate comfortably under a decentralized command and control structure, exercising initiative and decisive action at the lowest levels. Committed and professional, tomorrow's US Army will establish the new methods of war in the 21st century.

IX. Conclusion

The principle of maneuver, unchanged in concept, is finding new utility within the changing nature of war. Change will continue to be the norm, yet with change comes opportunity. The emerging opportunities to exploit the effects of maneuver are unprecedented. JV 2010 and Force XXI, fully aware of these opportunities, are placing a renewed emphasis on relational maneuver. Technology is opening new doors and

changing the application of maneuver. Information technologies will provide accurate and timely knowledge of friendly and enemy dispositions. Armed with this information, commanders can maneuver forces to dominate the enemy's decision ability and gain the temporal and positional advantage. Maneuver will create the enemy weaknesses that will bring decisive results. Firepower is also changing how maneuver is used. Precision fires, once only accomplished by maneuvering direct fires into position against the enemy, can now be accomplished through long range PGM's. Precision fires have maximized the effects of maneuver and, just as importantly, reduced its risk. Disengaged from the shackles of massive ground force battle, rapid, dispersed maneuver will enhance the protection of friendly forces while exerting a tremendous psychological force on the enemy. The increased ability to apply lethal ground force presence against the enemy is the new tool to defeat the new emerging threat.

However, positive change is neither certain nor unlimited. The realities of terrain and weather will work against achieving and sustaining maneuver dominance. Furthermore, the crucial uncertainties of trying to change a large organization, the transient nature of technology, the danger of an unpredictable enemy, and the risk of building on false assumptions threaten to negate even the best of plans. Breaking paradigms is neither easy nor risk free. However, the potential for increased maneuver capability is available, and if implemented, can bring the US military closer to what Sun Tzu called the true pinnacle of excellence--subjugating the enemy's army without fighting.⁷⁸

Endnotes

- ¹ Earl H. Tilford, "The Revolution in Military Affairs: Prospects and Cautions", Strategic Studies Institute, US Army War College, Carlisle Barracks, 1995, p 2.
- ² Edward N. Luttwak, *Strategy: The Logic of War and Peace*, (Cambridge: The Belknap Press, 1987) p.92
- ³ Gordon A. Craig, "Delbruck: The Military Historian", *Makers of Modern Strategy*, ed. Edward Mead Earle, (Princeton: Princeton University Press, 1943), pp. 272-273.
- ⁴ *Blueprint of the Battlefield*, TRADOC Pamphlet 11-9, HQ, US Army Training and Doctrine Command, Fort Monroe, VA, p. 7-1.
- ⁵ Ibid., p. 6-1.
- ⁶ Craig, pp. 272-273.
- ⁷ Ibid.
- ⁸ Luttwak, p.92.
- ⁹ Ibid.
- ¹⁰ Ibid.
- ¹¹ Ibid., p.93
- ¹² Giulio Douhet, *The Command of the Air*, Coward-McCann, Inc., 1942, reprinted by USAF Warrior Studies, Center for Air Force History, 1983, p. 28.
- ¹³ Ibid.
- ¹⁴ General Faugeron, "The Effects of Artillery Fire", *The Field Artillery Journal*, Vol. XXII, Jan/Feb. 1932, p. 59.
- ¹⁵ Ibid., p. 66.
- ¹⁶ Ibid., pp. 61-62.
- ¹⁷ Luttwak, p. 93.
- ¹⁸ Ibid.

- ¹⁹ Field Manual 100-5, *Operations*, HQ, Department of the Army, Washington DC, June 1993, p.2-10.
- ²⁰ Luttwak, p. 93.
- ²¹ Ibid.
- ²² Craig, p 274.
- ²³ *Joint Vision 2010*, Office of Chairman of the Joint Chiefs of Staff, Pentagon, Washington D.C., p. 20-21.
- ²⁴ Ibid., p. 22.
- ²⁵ Ibid.
- ²⁶ Ibid.
- ²⁷ General Gordon R. Sullivan, "Future Vision: A Vision for the Future", *Military Review*, US Army Command and Staff College, Fort Leavenworth, KS, May -June 1995., pp. 7-8.
- ²⁸ General Gordon R. Sullivan and LTC James M. Dubik, *Land Warfare in the 21st Century*, Strategic Studies Institute, US Army War College, February 1993, pp. 12-13.
- ²⁹ Ibid., p. 15.
- ³⁰ Ibid., p. 16.
- ³¹ Ibid., p. 22-23.
- ³² Ibid., p. 24.
- ³³ TRADOC Pamphlet 525-5, *Force XXI Operations*, HQ, US Army Training and Doctrine Command, Fort Monroe, VA., p. i.
- ³⁴ Ibid., p. 3-3.
- ³⁵ Field Manual 100-5, *Operations*, p. G-1.
- ³⁶ TRADOC Pamphlet 525-5, p. 3-8.
- ³⁷ Ibid., p. 3-9.
- ³⁸ Ibid., p. 3-10.
- ³⁹ Ibid.

- ⁴⁰ Ibid., p. 3-11.
- ⁴¹ Gary W. Anderson and Terry C. Price, "Leaving the Technocratic Tunnel", *Joint Forces Quarterly*, Winter 1995-96, p. 70.
- ⁴² Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century*, Little, Brown and Co., Boston, 1993, p. 64.
- ⁴³ Andrew F. Krepinevich, "Cavalry to Computer: The Patterns of Military Revolutions", *The National Interest*, No. 37, Fall 1994, p. 40.
- ⁴⁴ *Army Green Book*, 1995-1996, Association of the US Army, Vol. 45, No. 10, October 1995, p. 290.
- ⁴⁵ BG Huba Wass de Czege, "Mobile Strike Force: A 2010 Potential Force, *Military Review*", US Army Command And General Staff College, Vol. LXXVI, No. 4, July/August 1996, p. 71.
- ⁴⁶ LTC Lowry A. West, LTC David J. Mooney, and COL Anthony G. Pokorny, "Field Artillery in the 21st Century", *Military Review*, Vol. LXIX, No. 4, July/August 1996, p. 71.
- ⁴⁷ General Gordon R. Sullivan and Colonel M. Dubik, *War in the Information Age*, US Army War College, Strategic Studies Institute, 1994, pp. 13-14.
- ⁴⁸ *Army Green Book*, p. 267.
- ⁴⁹ Ibid., p. 254.
- ⁵⁰ Samuel P. Huntington, "The Clash of Civilizations?", *Foreign Affairs*, Summer 1993, pp. 22-39.
- ⁵¹ Robert D. Kaplan, "The Coming Anarchy", *The Atlantic Monthly*, February 1994, pp. 44-76.
- ⁵² William Lind, et al, "Fourth Generation War", *Marine Corps Gazette*, December 1994,
- ⁵³ Martin van Creveld, *The Transformation of War*, (The Free Press, New York) 1991, p. 197.
- ⁵⁴ Ralph Peters, "The New Warrior Class", *Parameters*, US Army War College Quarterly, Vol. XXIV, No. 2, Summer 1994, pp. 16-24.
- ⁵⁵ Van Creveld, p. 161.

⁵⁶ General John R. Galvin, "Uncomfortable Wars: Toward a New Paradigm", *Parameters*, US Army War College Quarterly, Vol. XVI, No. 4, Winter 1986, pp. 4-5.

⁵⁷ Ibid., p.5.

⁵⁸ Caesar D. Sereseres, "Lessons from Central American Revolutionary Wars, 1972-1984", *Lessons of Recent Wars in the Third World*, Vol. 1, ed. By Robert E. Harkarr and Stephanie G. Neuman (Lexington, MS: Lexington Books, 1985), p. 161.

⁵⁹ Kaplan, p 24-26.

⁶⁰ Karl W. Eikenberry, "Take No Casualties", *Parameters*, US Army War College Quarterly, Vol. XXVI, No. 2, Summer 1996, pp. 113-114.

⁶¹ A.J. Bacevich, "New Rules: Modern War and Military Professionalism" *Parameters*, US Army War College Quarterly, Vol. XX, No. 4, December 1990, p. 16.

⁶² Initial Impressions Report, Operation JOINT ENDEAVOR, Task Force Eagle Initial Operations. Center For Army Lessons Learned, TRADOC, Ft. Leavenworth, KS, May 1996, pp. 130-132.

⁶³ Department of the Army Pamphlet No. 20-291, *Historical Study*, "Effects of Climate on Combat in European Russia", February 1952, pp. 4-5.

⁶⁴ Department of the Army Pamphlet No. 20-242, *Historical Study*, "German Armored Traffic Control During the Russian Campaign", June 1952, pp. 2-3.

⁶⁵ LTC Howard V. Cooperider, et al , Research Report, "The Effects of Weather and Terrain on the Employment of Tanks", The Armored School, Fort Knox, Kentucky, 1952, pp. 42-49.

⁶⁶ Peter Sheppard, "Mobility Support to Offensive Operations on the Modern Battlefield", *NATO's Sixteen Nations*, December 1988, Vol. 33, No. 7, p. 66.

⁶⁷ U.S. Army, *How to Breach a Scatterable Minefield*, (Fort Leonard Wood, Missouri: ATSE-CA-T, US Army Engineer School, 21 December 1990, p.1.

⁶⁸ Star 21, *Strategic Technologies for the Army of the Twenty-First Century: Mobility Systems*, Board on Army Science and Technology Commission on Engineering and Technical Systems, National Research Council, National Academy Press, Washington, D.C., 1992, pp. 12-41.

⁶⁹ Patrick O'Sullivan, *Terrain and Tactics*, (Greenwood Press: New York), 1991, pp. 9-23.

⁷⁰ Michael Howard, "Military Science in an Age of Peace", Chesney Memorial Gold Medal Lecture given on 3 October 1973.

⁷¹ LTC Benjamin F. Keist, Student Individual Study, "Mobility on the Battlefield" US Army War College, Carlisle Barracks, PA, 1956, p.5.

⁷² Krepinevich, p. 36.

⁷³ A.J. Bacevich, "Preserving a Well-Bred Horse", *The National Interest*, No. 37, Fall 1994, pp. 43-49.

⁷⁴ Ibid., p. 37.

⁷⁵ Bellamy, p. 34.

⁷⁶ Ibid.

⁷⁷ Clausewitz, p. 127.

⁷⁸ Sun Tzu, *The Art of War*, translated by Ralph D. Sawyer, (Westview Press: Boulder, 1994), p. 177.

Bibliography

Books

- Bailey, J.B.A. *Field Artillery and Firepower*. Oxford: The Military Press, 1989.
- Bellamy, Chris. *The Future of Land Warfare*. New York: St Martin's Press, 1987.
- Bellamy, Christopher. *The Evolution of Modern Land Warfare*. London: Routledge, 1990.
- Bidwell, Shelford, and Dominick Graham. *Fire-Power: British Army Weapons and Theories of War 1904-1945*. London: George Allen & Unwin, 1982.
- Colby, Elbridge. *Masters of Mobile Warfare*. Princeton: Princeton University Press, 1943.
- Delbruck, Hans. *History of the Art of War: The Modern Era*, Vol IV, Trans. Walter J. Renfro, Jr, Westport: Greenwood Press, 1985.
- Douhet, Giulio. *The Command of the Air*. Washington DC: Office of Air Force History, 1983.
- Gray, Colin S. *War, Peace, and Victory*. New York: Simon and Schuster, 1990.
- Hooker, Richard D. Jr. Ed. *Maneuver Warfare: An Anthology*, Novato, CA: Presidio Press, 1993.
- Leonhart, Robert. *The Art of Maneuver*, Novato, CA: Presidio Press, 1991.
- Liddell Hart, B.H. *Strategy*, London: New American Library, 1967.
- Mets, David R. *Land-Based Air Power in Third World Crisis*. Maxwell AFB, Alabama: Air University Press, 1986.
- Military Aspects of World Political Geography*. Maxwell AFB, Alabama: Air University, 1959.
- O'Sullivan, Patrick, and Miller, Jesse W. Jr. *The Geography of Warfare*. New York: St. Martin's Press, 1983.
- O'Sullivan, Patrick. *Terrain and Tactics*. New York: Greenwood Press, 1991.
- Odom, William E. *America's Military Revolution: Strategy and Structure After the Cold War*. Washington DC: The American University Press, 1993.

Peltier, Louis C., and Percy, Etzel G. *Military Geography*. Princeton: D. Van Norstrand Company, INC., 1966.

Schwartz, Peter. *The Art of the Long View*, New York: Doubleday Currency, 1991.

Simpkin, Richard. *Race to the Swift*. London: Brassey's Defence Publishers, 1985.

Smith, Merritt Roe, and Marx Leo, eds. *Does Technology Drive History?* Cambridge, MA: The MIT Press, 1995.

Toffler, Alvin and Heidi. *War and Anti-War*. Boston: Little, Brown and Company, 1993.

Weigley, Russell F. *The American Way of War*. Bloomington: Indiana University Press, 1977.

Willoughby, Charles Andrew. *Maneuver in War*. Harrisburg: The Military Service Publishing Co., 1939.

Periodicals and Articles

Bacevich, A.J. "Preserving the Well-Bred Horse." *The National Interest* no. 37, (Fall 1994): 43-49.

Bunker, Robert J. "Advanced Battlespace and Cybermaneuver Concepts: Implications for Force XXI." *Parameters* vol. 26, no. 3, (Autumn 1996): 108-119.

Draper, Stephen E. "Mobility/Counter mobility in Winter Warfare." *Defence Update International*, vol. 45 (1984): 55-63.

Franz, Wallace P. "Maneuver: The Dynamic Element of Combat Power." *Military Review*, vol. LXIII, no. 5, (May 1983) 2-12.

Gabel, Christopher R. "Evolution of US Armor Mobility." *Military Review* vol. 64, no. 3 (March 1984): 54-63.

Goure, Daniel. "The Revolution That Isn't: The MTR/RMA as Counter-Revolution." Center for Strategic and International Studies, November 2, 1994.

Handel, Michael I. "Clausewitz in the Age of Technology." *The Journal of Strategic Studies* vol. 9, no. 2 and 3, (June/September 1986): 51-92.

- Helmhold, Robert R. "Rates of Advance in Historical Land Operations." US Army Concepts and Analysis Agency, (June 1990): 1-9.
- Heslin, John G. "Mobility: Key to Success on the Extended Battlefield." *Military Review* vol. 61, no.8 (august 1981): 57-63.
- Meilinger, Phillip S. "Ten Propositions Regarding Airpower." *Airpower Journal* vol. 10, no. 1, (Spring 1996): 50-72.
- Mountcastle, John W. "On the Move: Command and Control of Armor." *Military Review* vol. 65, no. 11, (November 1985): 14-39.
- Peters, Ralph. "The New Warrior Class." *Parameters* vol. 24, no. 2, (Summer 1994): 16-26.
- _____. "After the Revolution." *Parameters* vol. 25, no. 2, (Summer 1995): 7-14.
- _____. "Our Soldiers, Their Cities." *Parameters* vol. 26, no. 1, (Spring 1996): 43-50.
- _____. "The Culture of Future Conflict." *Parameters* vol. 25, no. 4, (Winter 1995): 18-27.
- Record, Jeffrey. "Getting There." *Parameters* vol. 18, no. 2, (June 1988): 89-95.
- Sapolsky, Harvey M. and Shapiro, Jeremy. "Casualties, Technology, and America's Future Wars." *Parameters* vol. 26, no. 2, (summer 1996): 119-127.
- Schneider, James J. "The Theory of the Empty Battlefield." *RUSI Journal of the Royal United Services Institute for Defense Studies*, (Summer 1987): 37-44.
- Wass de Czege, Huba. "Mobile Strike Force: A 2010 Potential Force" *Military Review*, vol. LXXVI, no. 4, (July-August 1996): 70-84.
- Weigley, Russell F. "Shaping the American Army of World War II: Mobility versus Power." *Parameters* vol. 11, no. 3, (September 1981): 13-21.
- Wilson, John B. "Mobility versus Firepower: The Post World War I Infantry Divisions." *Parameters* vol. 13, no. 3, (September 1983): 47-52.
- "Expendable Drones--Can They Restore Battlefield Mobility?" *Defence Update International*, vol. 90 (August 1988): 25-31.

Government Documents and Manuals

- Abrams, Creighton. "Mobility versus Firepower." Art of War Colloquium, US Army War College (February 1984): 93-108.
- Army Green Book*, 1996 ed. s.v. "Army Weaponry and Equipment", *Army Magazine*, vol. 45, no. 10, , Arlington VA.(October 1995)
- Carmichael, John M. *Maintaining Mobility on a High Tech Battlefield*. Fort Leavenworth, Kansas: School of Advanced Military Studies Monograph, 1989.
- Combat Engineer Systems Handbook*. US Army Engineer School, Fort Leonard Wood, Missouri, 1994.
- Combat in the Russian Forests and Swamps*. DA Pamphlet 20-231, Historical Study, Washington DC,: US Government Printing Office, 1951.
- Desolbry. "Mobility, Flexibility, and Dispersion." Command and General Staff College Paper, Fort Leavenworth, Kansas, 1955.
- Gavin, James M. "And I Don't Mean Horses." Fort Leavenworth, Kansas, May 1954.
- German Armored Traffic Control during the Russian Campaign*. DA Pamphlet No. 20-242, Washington DC, : US Government Printing Office, 1952.
- Hildebrand Marc R. *The Heavy Division Engineer Regiment--A Key to Tactical Freedom Of Action*. Fort Leavenworth, Kansas: School of Advanced Military Studies Monograph, 1991-92.
- Keist, Benjamin. "Mobility on the Battlefield." Student Individual Study, US Army War College, March 1956.
- Operation Joint Endeavor -- Bosnia Herzegovina, Task Force Eagle Initial Operations, *Initial Impressions Report* , Center For Army Lessons Learned (CALL), US Army Training And Doctrine Command (TRADOC), Fort Leavenworth, Kansas, May 1996.
- Schroedel, Joseph. *The Art and Science of Operational Maneuver*. Fort Leavenworth, Kansas: School of Advanced Military Studies Monograph, 1988.
- _____. *Tactical Mobility: Organizing Engineers for An All Arms Problem*. Fort Leavenworth, Kansas: School of Advanced Military Studies Monograph, 1987.

The Effects of Terrain, Hydrographics, and Weather on the Employment of Armor in Korea. A Research Report, The Armored School, Fort Knox, Kentucky, 1951-1952.

TRADOC Pamphlet 525-5, Force XXI Operations. Washington DC,: US Government Printing Office, 1994.

United States Army. *Field Manual 100-5, Operations.* Washington DC,: US Government Printing Office, 1993.

Effects of Climate on Combat in European Russia. DA Pamphlet 20-291, Historical Study, Washington DC,: US Government Printing Office, 1952.

United States Marine Corps, *FMFM 1, Warfighting.* Washington DC, US Government Printing Office.